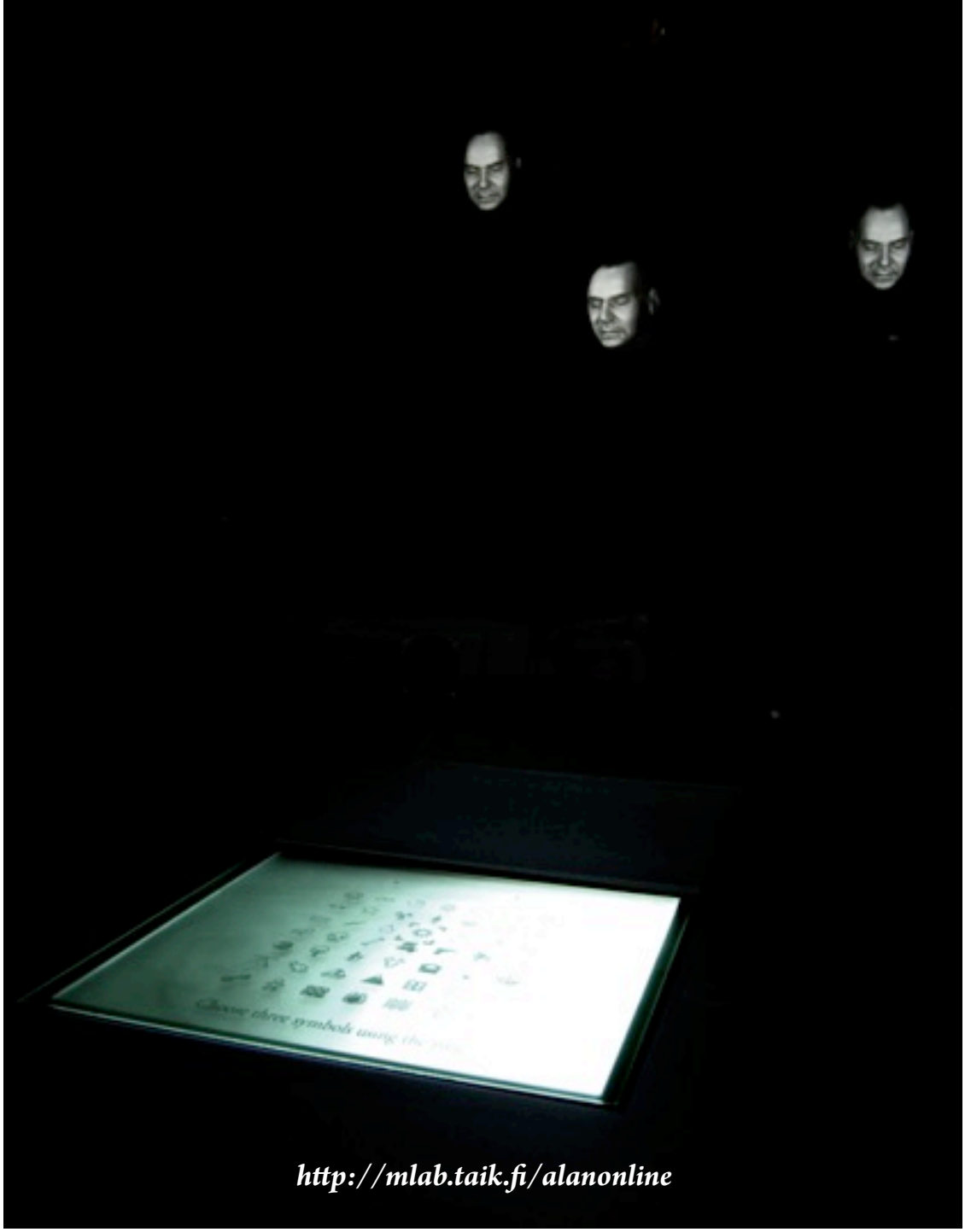
From Alan01 to AlanOnline

A study of the different characteristics of physical media installations and non-material media art



http://mlab.taik.fi/alanonline

OPINNÄYTETIIVISTELMÄ

Osasto	Koulutusohjelma	Valmistumisvuosi
Media Lab	MA in New Media	2009

Tekijä
Korpilahti, Teemu

Työn nimi
From Alan01 to AlanOnline - A study of the different characteristics of physical media installations and non-material art

Työn laji	Sivumäärä
Lopputyö	53

Tiivistelmä

This thesis is a study of the characteristics of the presentation media of artwork that can exist in physical and non-material form. Physical in this context refers to physical installations, and non-material is used to define artworks where the designer has little or no control over the presentation media, such as online artwork. I have chosen a set of characteristics, which I have found central to the topic, and my aim is to discover how such characteristics behave in practice. These key concepts are: technical aspects of the presentation media, human computer interaction, interface design, space, spatial narrative, collaborative experience, access, exhibition value, immersion, embodiment, real-world objects and metaphors. The set of characteristics is by no-means all-encompassing, but a selection that I have discovered through conversation with colleagues and professionals and through my personal research. It is also aimed to meet the requirements for the scopes of an MA thesis paper. The characteristics are discussed in reference to practical examples of artistic productions, and through my own work as a member of the production team that created the Alan01 installation and its non-material counterpart AlanOnline, which are used as a case study for this thesis.

Aineisto

Asiasanat
Digital media, Media art, non-material, online, remediation, installation, design, Alan Turing, SALERO, EU, Crucible, Alan01, AlanOnline, Turing Machine

Säilytyspaikka	Salassapitoaika päättyy
Media Lab	

Table of contents

1. Introduction 4
- *Personal background* 4
- *Research question* 5

2. Context of the case study 6
- *Background of the production* 6
- *SALERO Partners' tools* 6
- *Alan Turing* 7
- *Alan01 and AlanOnline* 8

3. Defining the subject matter 10
- *Relationship of art and entertainment* 10
- *Relationship of art and design* 10
- *Remediation* 11
- *Media* 11
- *Non-material media art* 11
- *Presentation media* 12

4. Characteristics of media installations and non-material media art 13
- *A taxonomy of the relationships between physical and non-material artwork* 13
- *Technical aspects of the presentation media* 14
- *Human computer interaction and the interface* 16
- *Space* 21
- *Spatial narrative* 23
- *Collaborative experience* 25
- *Access and exhibition value* 26
- *Immersion and embodiment* 27
- *Real-world objects and metaphors* 31
- *Comments and recommendations* 33

5. Case study 36
- *Alan01* 36
- *Image retrieval* 37
- *Symbol interface* 39
- *Light signaling* 40
- *Receiving the message* 42
- *Alan's voice* 42
- *Hannu Kivioja* 43
- *3D projections* 43
- *The soundscape* 44
- *The script* 45
- *AlanOnline* 46
- *User tests* 48

6. Conclusions 50

References 52

List of illustrations 53

1. Introduction

In this chapter I start by briefly explaining my personal background and how I have ended up doing this work. After that I describe the research question in a nutshell. In chapter two I explain the somewhat complicated context of the case study production and introduce the array of software tools that were used during the process. I then go through some of the keywords and concepts in chapter three, trying to lay the groundwork for the actual bulk of this thesis. In chapter four I start to open up the many different aspects of the question and finish the chapter with my personal comments and recommendations. In chapter five I explain the case study project in depth, and I also reflect on some of the points made in chapter four. Finally in chapter six I go through the conclusions and wrap up the whole thesis.

Personal background

My previous degree before starting to study at Media Lab, is a BA in multimedia production from Lahti University of Applied Sciences – Institute of Design. During the last year of my BA studies I had my first touch with Media Lab, as I joined Crucible studio's Tulse Luper Journey project, working as a flash game developer. I graduated from Lahti in December 2005, soon after which I started working as a web designer and site builder at Crasman Co Ltd. In the spring of 2006 I also applied and was accepted, to the MA program of Media Lab. At the time I decided to work full time for one year at Crasman, in order to gain some practical experience before starting my studies in the fall of 2007. In October 2008 I returned to Crucible Studio as I was hired as a storytelling software researcher in the context of the Turing Machine production, which led to the writing of this thesis. Prior to this production I have had little experience in pure art projects. My background is much more on the side of commercial work for corporate clients. I saw this project as a great opportunity for learning a new field of expertise. Physical interfaces and props were also a new and interesting challenge that I was keen to take on. Previously almost all of my work has been on screen based applications, mostly websites and other browser based content.

Research question

This thesis should not be considered as an instruction manual of how to create a media installation. Neither is it an attempt to explain how to successfully make an online artwork. The core of the question is in the relationship of the physical and the non-material. This is not a juxtaposition of the two, many aspects are shared by both instances, where as others are specific to the presentation platform. My aim is to provide an answer to the questions: "What are the characteristics of the presentation media that should be taken into account, while designing a project that entails parts that exist both physically and non-materially?" and "How do such characteristics behave in practice?".

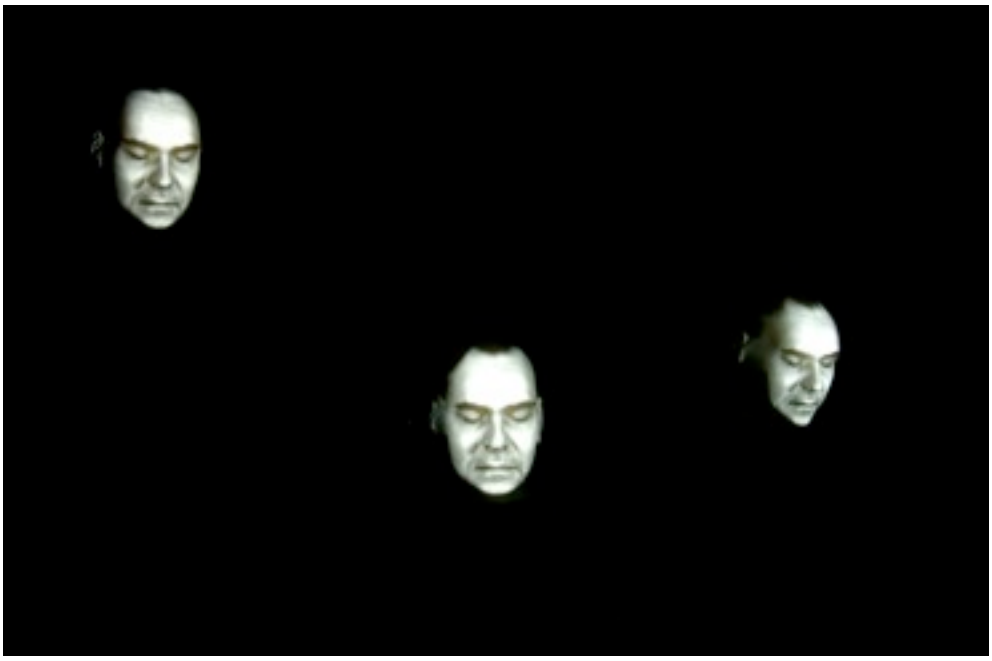


Figure 1, Alan01 is asleep

2. Context of the case study

In this chapter I explain the context of my case study production. I go through the infrastructure behind the project and shed some light to the hidden agendas that affected the work. I introduce the software tools that were used in the production and evaluated based on the tool users' experiences. Later on, in chapter five the case study production is described in detail, but already in this chapter I give a short introduction to Alan01 and AlanOnline, and also introduce the members of the team who created the artwork, and what their roles were in the production.

Background of the production

I have written this thesis as a part of my work at Crucible Studio that is a research group in Taik's Media Lab, which explores new forms of storytelling in dialogue with new media and traditions of drama (Media Lab Helsinki, 2009). During the writing of this paper I was working as a storytelling software researcher at the studio. My work entailed creating the technical framework for the Alan01 installation, designing and programming its software interface as well as creating the installations online version. Crucible's Turing Machine, part of which Alan01 and AlanOnline are, is an experimental production for SALERO, short for Semantic Audiovisual Entertainment Reusable Objects. SALERO is a European research project, which investigates the production of digital content aiming to create cross-platform, re-usable tools for production (SALERO, 2009). Crucible's role within SALERO is to evaluate software tools developed by SALERO project partners, by attempting to use them in the studio's experimental productions. The project website for the Alan01, AlanOnline and all the other parts of production can be found at: ***http://mlab.taik.fi/alanonline***.

SALERO Partners' tools

Aspect Browser is a content based image retrieval tool developed by the University of Glasgow (UG). It is part of their ongoing research, as they continue to develop new image retrieval methods. The key feature of the system is that it allows the user to input an image as a reference for the image search. The system can be configured to use multiple different methods to try and find visually resembling results. The matching can for instance be based on coloration, contour shapes and/or textures.

In the Turing Machine production we also used the Text-to-Speech synthesis tool developed by Universitat Ramon Llull Barcelona (URL). A script of 150 sentences were created into audio files using URL's tool. The synthesized speech was used as the voice of Alan Turing in both Alan01 and AlanOnline. The best quality voice happened to be female, so we needed to transform it into a male voice fitting for Alan Turing. Another of our SALERO partners had a tool just for that. Universitat Pompeu Fabra in Barcelona (UPF), is developing a tool called Sound Transform which allows the user to alter the characteristics of a spoken voice. A young persons voice can for instance be transformed to sound like a 70 year old person, or as in our case the gender of the voice can be easily transformed from male to female and vice versa.

The sound scape of AlanOnline was further enhanced with DTS's (Digital Theater Systems) Virtual Surround Sound tool. The software takes in five channel surround sound and creates a virtual surround stereo sound file that can be listened to using regular headphones or stereo speakers. AlanOnline's relatively limited soundscape didn't really take full advantage of the potential of the tool and it was basically just integrated to please the administration of the EU project.

Maskle is another tool from Universitat Pompeu Fabra. It is a system for the automatic weighting for facial animation. The tool was used by Merja Nieminen who created all of the 3D content of the production and used Maskle in some parts of her work.

Alan Turing

The story that the production is built around, is based on the life of Alan Turing. He was a British mathematician who worked as a code breaker during the Second World War. He was successful in deciphering the German Enigma encryption system and was awarded as an Officer of the Order of the British Empire for his work. He is also regarded as the inventor of the digital computer, and a pioneer in the development of artificial intelligence. Alan Turing was arrested in 1952 for homosexual behavior and was convicted to take injections of estrogen that were intended to neutralize his libido.

Figure 2, Alan Turing

On June 8th 1954 he was found by his cleaner, he had died after eating an apple poisoned with cyanide. His death was considered as suicide (Hodges, 1995).

Alan01 and AlanOnline

The Alan01 installation lets the user engage in conversation with the fictional spirit of Alan Turing that has been preserved inside a machine at the time of his death. The interaction with Alan01 happens via a glass touch surface by selecting a series of three symbolic images that are relevant to Alan Turing's life. The symbols are connected to 150 words, which trigger Alan01's responses that are sentences, video clips and animations projected on the plastic busts of Alan. Actor Hannu Kivioja played the role of Alan Turing in the video clips and was the model for the busts. The 3D content was created by Merja Nieminen. Jaakko Pesonen was the lead designer and director of the installation as well as the architect of its physical construction. The concept was co-operatively designed by Jaakko Pesonen, Merja Nieminen and myself. The textual content was based on Leena Saarinen's script for Turing Enigma, and dramatized by Jaakko Pesonen and Mika Lumi Tuomola, who is also the artistic director of Crucible Studio. The producers of the project were Tea Stolt and Severi Glanville. Markus Norrena worked as a technical consultant for the project and is also the supervisor of this thesis together with Christopher Hales.

Figure 3, Alan01

Figure 4, AlanOnline

AlanOnline is the non-material counterpart of the Alan01 installation. The online version offers a second interface and another aspect to the media content that is shared with the physical installation. In AlanOnline the selection of symbols on the touchscreen has been replaced by a drawing interface, where the user explores the content by drawing a sketch, which is then processed by the University of Glasgow's image retrieval system. The image retrieval tries to find the closest match to the user's drawing from a database that contains the same symbols as the interface of the installation. Content is then triggered in a similar fashion as in the installation. The online version is essentially my own project, where I had liberty to do what ever I wanted.

I submitted the Alan01 and AlanOnline production to the interactive installations category of the Europrix Multimedia Awards 2009 competition. The project was evaluated in two rounds by two different panels of jurors and it was awarded the official EUROPRIX Quality Seal. By awarding the quality seal the jurors recommend the project to consumers and recognize it as highly innovative and creative.

Following the co-operation with the University of Glasgow, we (Mika Tuomola, Teemu Korpilahti, Jaakko Pesonen, Abhigyan Singh, Robert Villa, Punitha Swamy, Yue Feng and Joemon Jose) wrote a paper titled ***Concept, Content and the Convict.*** It explains the different methods of content based image retrieval and how they were used in our artistic production. The paper was accepted to the Interactive Art Program of the ACM Multimedia 2009 conference in Beijing, where it will be presented shortly after the writing of this thesis.

The reason for using the project only as a case study, rather than making it the main topic of the whole thesis, was the fact that I felt the frame of the production was too complex to make a coherent whole, and my creative freedom was constrained by the necessity to integrate as many as possible of the SALERO partners' software tools. Schedule-wise it was also clear from early on that most of my time would be spent on creating the installation. All of the video and animation content was primarily created for the needs of the physical installation and the design of the online piece needed to accommodate it, since there weren't really resources for creating a lot of content separately for the online artwork. I therefore wanted to keep the actual making of Alan01 and AlanOnline somewhat apart from my thesis. Instead I tried to think of what are the underlying and relevant questions that I'm trying to solve in my practical work and write a thesis that is more research oriented. Still, since the production is very relevant to my research question, I wanted to include it as a case study, to show that in addition to theory, my work is also based on practice.

3. Defining the subject matter

In this chapter I talk about the key aspects of the topic. I try to frame the subject matter in such a way that it makes a coherent whole, while maintaining the scope of the work in relation to the requirements of a MA thesis project. Excluding some aspects of the topic can be artificial, therefore many of the things I discuss can be attributed to a much wider field of media than what is handled here.

Relationship of art and entertainment

In this paper I use the term "non-material media art" and discuss the properties of physical art installations. Similar entertainment and information applications are affected by the same phenomena. The fact whether a media composition is considered art mainly affects the user's initial expectations of the piece. Art doesn't share the same preset efficiency demands as game interfaces or word processing software tools. Artworks in general have a bit more liberty with the methods they utilize in user interaction. Art can often even serve as a venue for experimental interaction technologies, which might later be adopted to commercial and industry applications (Kuivakari et al, 1999: 31). The case study of this paper is an art installation, therefore the discussion is more focused towards artworks, while some features that would specifically affect information, commercial and entertainment pieces are not a part of this work.

Without going into a lengthy aesthetic discussion about "what is art?", I propose that a work should be considered as art, if it is intended to be exhibited in the context of art. Much in the same way as Jerrold Levinson has defined it (Davies, 2001: 174).

Relationship of art and design

Even though I am operating in the field of art, my approach to the topic of this thesis leans more towards that of a designer. Compared to traditional visual arts like painting or sculpture, media installations that consist of various different hardware devices and software applications emphasize the importance of the design oriented approach. My personal background is also that of a designer rather than artist. My treatment of the topic aims for such values as usability, intelligibility and accessibility.

Remediation

Remediation can be seen as a straightforward process of taking content produced into one media form and manipulating it to fit another. I prefer to define remediation in this context in a wider sense, as Jay David Bolter and Richard Grusin (2000: 56) describe it, as mediation of mediation, where every act of mediation is dependent on another, and thereby any act of mediation can be considered remediation. We can never be completely oblivious to the history of mediation that surrounds us in our everyday life.

Media

Bolter and Grusin (2000: 66) propose that "a medium is that which remediates". Every form of media exists in a relationship of respect and rivalry with other media (Ibid.). I have chosen not to use the term "new media" in defining the scope of this work. That is because it is very difficult to define what forms of media should be considered new. Using the affix "new" for an extended time period is also questionable. A more fitting term for my framing is digital media. While media installations are not limited to digital media, my definition of non-material media art often exists in the form of software and digital data. Therefore the focus of this work is mainly in the field of digital media.

Non-material media art

The use of the term non-material in this thesis is the result of a lengthy process, during which I have gone through many alternatives and dismissed all others. All this time I have been looking for the best suiting all-encompassing term for this form of art, which is the counterpart of physical installations. I first started with the term online art, simply for the reason that AlanOnline is an online piece and internet is at moment one of the most common distribution platforms for these kinds of pieces. After a while I gave up using the term, because I felt that the fact whether an application is online or offline, is not the defining characteristic. For instance in the early nineties, before internet became widely available, CD-ROMs were the platform of choice for the distribution of such artworks. Another alternative that was suggested to me, was mass distributed art. It is true that the motivation for creating non-material art often is mass distribution, gaining maximum coverage for the work and enabling people to access it over great geographical distances. Still I see mass distribution as an attribute of non-material art rather than as a the top level concept which I'm looking for. Following this line of thought, I also considered the term software art, since in my approach the works that I am writing about all exist in the form of software. However software art still doesn't describe accurately the essence of the art form. Finally I considered what is the opposite of physical and ended up with immaterial art. This term for a native

Finnish speaker seemed to make perfectly good sense, but as it turned out immaterial in English has some negative undertones insinuating something is meaningless or unimportant. As a final step I settled for non-material art instead.

Presentation media

A designer of an installation or any material artwork has the ability to design the presentation media. The designer can decide whether a piece has video projectors or multiple screens. She can specifically decide the dimension of the physical props, their positioning and orientation. She can even choose the detailed hardware specifications of the output and input devices. I use the term non-material media art to describe pieces where the designer has practically no control over the final output device and also no control of the surrounding circumstances, where the piece is used. The display of the user might range from a 13" laptop to a 24" widescreen. Similarly the speakers might be anything from simple headphones to a 5.1 surround sound home theater. The physical environment of a user might also vary greatly. The user experience while traveling in a bus full of strange people, is very different from using the same application sitting on the sofa at home. This frees the designer from the responsibility of designing the physical environment, but at the same time, forces her to consider a wide range of scenarios. The designer often has to compromise in order to not exclude potential users because of hardware requirements specified by the piece.

4. Characteristics of media installations and non-material media art

In this chapter I go through a selection of characteristics that I find as fundamental for comparing media installations and non-material media art as art forms. During this process I reflect on how these characteristics emerge in the case study, and compare this production to other relevant installations and non-material artworks. The case study is a project where an installation was translated into an online artwork. Both the installation and the online version make use of many of the same media objects. This offers perhaps the most fruitful ground for making comparisons between the two forms of art. I have tried to find similar projects, where physical and non-material versions have been created around the same theme, to serve as the other reference artworks. In addition I make references to some individual artwork which only exist in either physical or non-material form.

A taxonomy of the relationships between physical and non-material artwork

I suggest that the different approaches to creating an online or other non-material version of an installation, can be divided to five rough categories:

1. The content of an installation is directly transferred to the non-material form. A copy of the original installation is created without making many adaptations for the new presentation media. A good example of this type of adaptation is Jacques Davis' (2009) ***Manifestation.*** The physical piece is a 20 minute video installation of the paris manifestation, which took place on the 29th of january 2009. The video material shot with ten video cameras, is presented on a totem made of 9 LCD-screens. The online version of the piece is much like a video presentation of the LCD totem, scaled down to fit in to the height of little more than 700 pixels. The presentation gives a good idea of how the piece can be exhibited in a gallery space and that seems to be its single purpose.

2. A documentation of the physical installation is provided in a new format. The aim here is to give an understanding of what the physical installation is like. CyberArts 2006 is the annual DVD/CD compilation of Prix Ars Electronica (2006). It presents among other things documentaries of the awarded media installation projects. Typically the experience of the user is that of observing someone else interacting with the installation. Interaction on the level of the non-material version is less important. Most commonly this type of work functions mainly as marketing and documentation material.

3. A unique non-material artwork is constructed around the same theme as the physical installation. Media objects can be re-used and there can be many other similarities with the physical installation. The aim of the non-material artwork is to provide some new aspect to the theme or provide a unique interface to the interaction with the content. Our case study the ***Alan 01 / Alan online*** cross media production falls into this category.

4. Co-existence of physical and non-material artwork. Both counterparts form the whole, and their relationship is an important part of the concept. In ***The Salt Satyagraha Online*** Joseph DeLappe (2008) reenacted Mahatma Gandhi's 1930 Salt March. The reenactment took place physically in Eyebeam in New York City, where DeLappe walked the entire 240 miles on a converted treadmill. At the same time, the treadmill controlled DeLappe's avatar that walked the same journey inside Second Life.

5. The last of my categories is definitively different from the previous examples. Alan Natachu's (2009) ***playing NDN*** started as a series of short films examining the Native American motif in video games. From its non-material form, the project later grew to a physical art installation in the form of an arcade cabinet. This project is an interesting example of an opposite development, expanding from the non-material to the physical.

Technical aspects of the presentation media

The technical configuration of an installation is a controlled environment. The output and input devices are defined by the designer and chosen by their ability to accommodate the content of the piece. Experimental devices like movement sensors or robotics can be used, and even specifically designed and manufactured for the artwork. One interesting aspect in the relationship of physical and non-material forms of art is, that a typical screen based interface can exist as a part of an installation but not the other way around.

Alan01 featured a relatively large amount of different hardware. We had three units for displaying the media content, each of which consisted of a 24" iMac that was connected to a Acer K10 mini projector, a single car speaker that was used for mono output and an iSight web camera. These machines and equipment were selected on the basis that they had to work as aesthetically pleasing and unnoticeable parts of the installation, so that the focus of the user would be on the content and not the hardware. In addition we had a main unit which handled the user interface. The main unit consisted of a Mac mini computer that was connected to a regular video projector and a digital video camera. This part of the hardware was completely concealed from the user, and was therefore chosen based on what hardware met the minimum technical requirements and was available for us at the lowest possible cost.

Figure 4, Alan01 hardware setup one week before the premier

Even though in the case of non-material media art the devices don't have as wide a range, they can still differ greatly from case to case. What is significant for the designer is, that these variations can't be controlled. The common home devices – monitor, speakers, mouse and keyboard – have a wide enough variety as it is, additionally the use of other devices like web cameras and microphones is an option that expands the possibilities of interaction further. The primary design decision in this context is that of first selecting what devices can or need to be used with the piece. Does the user need a computer or a DVD-player, and in the case of a computer, what input devices does she use? The next step to take is defining how these devices are used, usually on the level of the software. This could mean the selection of an appropriate screen resolution and a host operating system or considering how big video files can be streamed in an online piece. Of course this second level also affects and is affected by the decisions made concerning the hardware.

In AlanOnline we first considered using Processing, which is an open source programming environment, for the creation of the online artwork. The motivation for this was the fact that we were initially considering using realtime 3D graphics in both the installation and the online version. Later on, as it became clear that the 3D material would be rendered into movie clips, I decided to make the online application with Adobe Flash. This choice was simply based on the fact that Flash was better supported across most common web browsers and operating systems, compared to the Java based Processing. Processing also seemed to have more bugs and technical restrictions and was clearly inferior when it came to media playback. The graphic interface was designed to fit inside a display resolution of 1280x800, which at the time was starting to be widely supported even in small 14" laptop screens. The only required input device was the mouse.

The rapid development of technology poses a challenge especially in the case of non-material pieces. The size of computer displays has grown both measured in inches and pixels. Content designed to accommodate the limited resolutions five years back, can look unattractively small on a modern display. The increase in bandwidth speed of internet connections' has raised our expectations of what the quality of a video image should be. In the worst case scenario a piece is not only altered unattractive by the passing of time, software incompatibilities can render it completely inaccessible. Apple's shift to OS X and various version updates of Windows have made many art CD-ROM's from the mid 90's completely useless for most users.

Human computer interaction and the interface

Throughout the history of computers, interaction with machines has fascinated researchers and users, and by this day it is a big part of our everyday lives, as consumer electronics have surrounded us in many varying forms. What makes interaction so interesting? In her Book ***Computers as Theatre*** Brenda Laurel (1993) compares human computer interaction and interface design to theatre and drama, and suggests that by studying interaction with its theatrical aspects in mind, many of its characteristics are easier to understand. Laurel (1993: 1) uses ***Spacewar,*** one of the earliest known computer games made at MIT in 1962, as an example of the importance of interaction in computer programs. The designers of the game recognized action as the key ingredient, and created a game that combines thinking and doing in a balanced manner. They realized that the computer by its nature is suited for representing things that can be seen, controlled and played with. The game's potential was in its ability to represent action where users could participate.

Laurel (1993: 7) also makes a reference to the work of Donald A. Norman, founder of the institute for Cognitive Psychology at the University of California, and agrees with Norman's idea that effective interfaces should begin with an analysis of what the user is attempting to do, rather than with an interface metaphor or concept of what the screen should display. The desired action of the user is key in interaction design and interface is the mediator of interaction. A similar importance of action can be attributed to functionality. As functionality could be simply defined as the level of efficiency of how a user can perform an action with a tool. Laurel (1993: 44) confirms an additional notion on the nature of functionality, re-conceiving it as what a user can do with a program, rather than what the program is capable of doing. A hundred and one features will do a user no good, if they are not specifically designed for the user's needs. Following her juxtaposition of theatre and computers, Laurel (1993: 9) proceeds to suggest that the role of a graphic designer in interface design is similar to that of the theatrical scene designer. The graphic designer draws the environment where the action takes place. Setting the stage in a specific way emphasizes certain actions over others, draws the user's attention to important details and hopefully also makes the whole experience more aesthetically pleasing.

A protagonist is a principal character in a story or a drama (Harper). The term protagonist is also often used in the field of HCI design. A protagonist is the one who takes action and participates, someone with a heightened level of interaction with the system. Erkki Huhtamo (1995) describes how television addresses the viewers in an attempt to catch their attention, and to stop them from changing the channel, where as interactive systems force the user to make choices continually and reconsider the situation. The user cannot settle for being passively carried away by the system. Where Laurel writes more specifically about interaction with computers, Huhtamo's point of view is more generally discussing interactive systems that are not limited to computers. In this sense I feel Huhtamo's text is more suitable for evaluating physical installations, which may contain computer interfaces as their structural parts, but don't need to be limited to computers.

Installations have a tendency to challenge users on the level of the interface. In my opinion, more usability is expected from computer screen interfaces. The functionality of the non-material artwork is compared to the various software applications we use in our everyday life. The shift from using the interface of a web browser, to immersing oneself to the artwork inside a software window is quite unclear. In the physical world, when a visitor enters a gallery space, the context prepares her for the experience she is about to have. In the case of the software application, there is no similar transition space between the two realities, which would mentally prepare the user to the challenge of the art interface that lies ahead. Christoph Blase (Artintact 2, 1995: 20) suggests that the user of a computer screen based medium, such as a CD-ROM, is more able to access structured data than a person that is accessing similar content in an exhibition situation. In many

cases this is true, but I would argue, that the reason for this isn't the characteristic nature of either form, but rather the fact that art installations have assumed a role as a platform for experimental interaction technologies. There is no reason why an installation couldn't serve as a highly functional interface to structured data, but in the context of art such installations can easily become dismissed as being boring.

Figure 5, Ken Feingold. Where I can see my house from here so we are. 1993-1995.

Certainly there are many online artworks that try to stretch the boundaries of usability with interfaces that are a riddle to the user. Figuring out the ways to interact becomes a part of the experience. Ken Feingold's works, that range from physical installations such as ***Where I can see my house from here so we are*** (see figure 5) to non-material pieces like the ***JCJ-Junkman*** (Artintact 3, 1997), challenge the users and their pre-set ideas about interactivity. Huhtamo (1995) compares Feingold's artwork to labyrinths, which give little advice for the user who is struggling to find her way through the maze. Some users that are faced with these seemingly impenetrable obstructions, must be frustrated while they try to figure out the logic of the system. The users with their preconceptions about interaction, are likely to attribute the illogical response of the interface to bad programming or a technical failure.

Huhtamo (1995) also raises the question whether interactive systems should contain a didactic subtext explicitly guiding the user or should they be more "intuitive", relying on trial and error? Zachary Lieberman's (2006) ***Drawn*** features an interface where the users utilize real ink to paint on paper. The painting then becomes alive in the form of a projection, which the users quickly learn to manipulate by tapping, nudging and poking the ink across the paper. In the interfaces of software applications we use for productive purposes and daily work, "intuitive" is a word that might be used for marketing purposes or design specifications, but truly intuitive software interfaces are quite rare. Learning by trial and error, on the other hand, is something we are commonly forced to do while starting to use a new interface, but once the weight of the action starts to move too much towards making errors repetitively, learning soon becomes unrewarding.

Huhtamo (1995) recognizes the shift from human-computer "conversation" to that of the "common ground", in the field of interface research. In this context conversation is implying an action of exchange between the system and the user, which are separated by the interface. Common ground is a definition for a more symbiotic relationship, where knowledge, beliefs and assumptions are shared by the two parties. Huhtamo explains, that according to this theory, the result of both human and computer learning to gradually share these assets, is the growing transparency or even disappearance of interfaces. The assumption here is that naturalness, immediacy and intimacy, are the direction in which the human-machine relationship is evolving. I can see something similar to the concept of common ground, in Laurel's (1993: 12-13) description of the models of the interface. According to her, the user has a mental model of the computer and the range of actions it is likely to be able to handle, where as the computer also incorporates some information about the user's goals. And the dimensions of common ground don't stop there, as an interface can also be considered to be a collaborative exercise of the imaginations of the makers of the interface and the people who use it (Laurel, 1993: 29).

Huhtamo (1995) also makes an interesting comparison of automation and interaction, pointing out how automated machines were introduced in order to eliminate physical work. In doing so they also eliminated the user's continuous contact with the machine that was functioning independently, but still safely under control. The active intervention of the user was restricted to high level controlling functions. For me the keyword here seems to be "control", and interestingly not the control of the system, but the control of the user. Interaction of the user is limited and thereby the single most unpredictable participant of the relationship is removed, the system is liberated to go on about its business as long as the user doesn't pull the plug out of the wall. Huhtamo (1995) goes on to question our preference to interaction rather than automation: "Why desire a constant intercourse with machines instead of a simple sense of mastery?". Simply put, a higher level of interaction enables more detailed control. Highly automated machines are only good at doing one thing, where as computers can be used for a wide variety of purposes. In the context of art, I propose that that people are fascinated by interactive pieces, because of the illusion that the system actually tries to understand what the user wants and responds in a logical way that still isn't as predictable as a strictly automated system. There is a small sense of magic in not being able to decisively explain the intelligent behavior of the system.

In Alan01 our approach was to simplify the user's interaction as much as possible. The installation's interface is a glass surface where the user selects symbols using a wooden ring. The system confirms the selection of a symbol via a time delay. If the ring remains on top of a symbol for long enough, the symbol is selected. The time delay was used because we didn't want to force the user to confirm the selection with a separate button or gesture. Monitoring the users we noticed that even the selection of symbols was challenging enough for many untechnical people, who didn't

know what to expect from the interface. The time delay seemed to work for the users quite naturally and proved to be a good solution. Another interesting observation was that people really do not read instructions, even if they are right in front of their noses. The selection of one symbol seemed to fit the logic of the users relatively well, but many at first didn't realize that the installation would wait for the user to select three symbols. This was slightly surprising since we had a text: "Choose three symbols using the ring" projected right on to the interface, next to the symbols in a large sized font. The requirement of three symbols was a decision that was based on the content of the artwork and the concept of telling a story. A single symbol or word doesn't so much constitute a sentence or story, but immediately when you build a series of two or more symbols, their associations and relationships with each other can be conceived as a small sentence. The same logic is true for the video and audio content that is played as Alan Turing's response to the symbols. As the content is played in a sequence of three twenty second clips, they also build a short one minute movie that is edited adaptively.

In AlanOnline the user is faced with more options of interaction then in the installation. These additional options were introduced to accommodate the restrictions of the online media and also the content based image search that is the main input control for the artwork. Since the interface is a computer screen that is controlled with the mouse, it is also easier to introduce more options since the input device is already familiar to most users. The user of AlanOnline can first draw an image on the surface of a cube and then send it to the image retrieval system. The system then delivers the top three results of the best matching images from the set of forty nine symbols that are the same as in the installations. Ideally the system should deliver only the best match, but since the quality of the search results wasn't accurate enough, the final filtering of the results had to be left to the user. The user can then click on the search results and access the connected media content. In AlanOnline the selection of a series of three symbols also had to be simplified to a single symbol, mostly for bandwidth reasons. I wanted to keep the online version accessible also for slightly slower internet connections, so simultaneously streaming video and audio content for three symbols would have been too com-

Figure 6, Jaakko Pesonen testing the installation interface

plicated, and would have slowed down the experience of the artwork. In my experience computer and internet users often also expect a higher level of immediacy and there is a culture of rapidly clicking in search of new content, so the one symbol approach seemed more appropriate for the online experience. This was also a compromise in the sense that since the interaction had been made more complicated by means of drawing and selecting the search result, it made sense to simplify it by keeping the reaction to the symbol selection more immediate. Even though the online version features a large visible button for reading instructions, my aim was to keep the interaction so simple that a user could potentially figure the system out without additional information.

Space

Space is more than volume. It has more than three dimensions. A constructed space is not limited to the buildings designed by an architect. It can comprise the people presently within the space and their interaction with each other, as well as the history of the location and many other aesthetic dimensions. A physical space is a subjective experience that is individually defined by the observer. Kirsi Saarikangas(1998: 248-249) defines that a constructed space is at the same time an architectonic, material and social space, a collection of heterogeneous cultural practices, images and ideas. Saarikangas also expands the definition of space to include the user. She states that in fact, both the space and the user are shaped by their two-way interactions in the process of the different usages of the space.

What then is the space of a software application. Typically we experience this space through a square computer display. This window serves us as a peephole to another reality, a pseudo space. The world inside the screen is often built with real-world metaphors to make it more easily approachable. However the primary goal of this space is not only to mimic the real world. Lev Manovich (2001: 202) states that "Synthetic computer-generated imagery is not an inferior representation of our reality, but a realistic representation of a different reality".

For the designer, an installation space has a dualistic nature. On one hand she has to consider the spatial qualities of the installation itself, and on the other she has to take into account the space wherein the installation is to be placed, be it a gallery, a public space or something else. When an installation is exhibited in different spaces over time, the designer might decide to make adaptations to the work according to each specific location. The initial design of the installation can also limit the potential spaces where it can be exhibited. Johanne Lamoureaux (in De Oliveira, Oxley And Petry, 2003: 28) states that a shift can be seen in the artist's relationship to the exhibition space. When the focus of the artwork's design previously used to stress site-specificity, nowadays installations are more often designed to be movable pieces that are transported from one exhibi-

tion space to another. At the same time artists have also started to resist the art institutions' central role in the creation of installation art. Many artists prefer to move away from projects that are specifically designed to be exhibited in a museum (De Oliveira, Oxley And Petry, 2003: 78). Still, the role of the institutions is emphasized in installations that require a wide range of skilled professionals and substantial funding for their technical and physical construction. Installations have in this sense become collaborative projects, that also emphasize the value of the process of creating the artwork, rather than just the outcome (De Oliveira, Oxley And Petry, 2003: 81).

A designer of a non-material artwork does not have similar control over the exterior space as an installation artist. If we consider an online artwork or a CD-ROM, the surrounding environment of the user can be virtually anything. This doesn't mean that the designer shouldn't consider them. To achieve some level of control the designer must think about the target audience. What are the typical users of the piece and what is the most common output device they might have. The designer could also consider what is the most common environment where the user would use such a piece. The design choice here could mean the choice of distribution media, whether to make an online, DVD, CD-ROM or mobile version. In fact, wouldn't creating a software version for a modern game console guarantee an optimal surrounding environment for experiencing a work of art.

The physical design of Alan01 is strongly self contained. The installation has its separate interior space wherein the content is displayed. The exterior design is a large wooden box which contains all the technical devices. The self contained design was partially dictated by the need to prevent any possible vandalism to the equipment, but also to make it suitable for many different types of gallery and public spaces, where the installation would only set requirements by its physical dimensions. The interior space is a black box that strongly focuses the users attention on the media content and conceals the technical devices.

The space of AlanOnline is a white landscape, that on closer examination reveals itself as a massive circuit diagram that disappears to a distant imaginary horizon. In the center of this pseudo space is the main interface – a white slightly translucent cube. Two computer displays float in mid air beside and above the table. Picture planes displaying the image retrieval results appear stacked in perspective on the left side of the cube. The design of the interior space of AlanOnline is a metaphorical cyberspace, that puts the user inside the machine that the spirit of Alan Turing is inhabiting. The aim here was to take advantage of the non-material presentations potential for creating an imaginary space that isn't bound by the physical restrictions of the real world.

Spatial narrative

In his book ***ON THE "TOTAL" INSTALLATION*** Ilya Kabakov writes about the specific case of a "Total" installation that is an installation concept, the construction of which, he defines with very specific rules. In doing so he also analyzes installations in general. Kabakov (1995: 311) defines that installations are similar not only to visual arts like painting, sculpture and architecture, but also to temporal arts like theater and cinema. By Kabakov's definition the temporal aspect can be seen in the viewer's movement through the installation space. According to Kabakov, this temporal movement can serve to create the drama of the installation.

Saarikangas (1998: 251) writes along the same lines, and states that in addition to its temporal dimensions, the space also quintessentially comprises the moving and sensing subject and its time-space properties. Based on this, the design of an installation should incorporate a plan for how the user might or should move in the space, presuming that the installation's nature is three dimensional enough to incorporate movement in the space.

Figure 7, Gustave Courbet. A Burial at Ornans. 1849-1850. Oil on canvas. 314 x 663 cm.

How then can we consider spatial narrative to take place in the non-material piece of art. As an example, a two dimensional computer screen doesn't seem to support spatial narrative inherently. In the case of traditional cinema, storytelling started out as sequential and to this day that tradition affects contemporary movies strongly. Shots appear on the screen one at a time often in chronologic order. But in fact spatial narrative has a long tradition as a tool in storytelling on two dimensional surfaces. Manovich (2001: 322) recognizes historical examples like Giotto's fresco cycle at Cappella Degli Scrovegni and Gustave Courbet's ***A Burial at Ornans,*** where artists presented several different events in a single space (see figure 7). In Courbet's painting a long line of mourners cue to the grave in a great S-curve. The members of the crowd form many small

groups, each of which are frozen in their own narrative sphere. In Giotto's fresco cycle each event of the narrative is framed separately but the entirety can also be viewed in a single glance. Sometimes different events could be presented as if they were taking place in the same pictorial space, or alternatively events that could be thought of as separate parts of a narrative, but which were separated by time, could be depicted in a single painting. Finally Manovich (2001: 322-323) describes how traditional cinema's sequential narrative is contrasted by spatial narrative, where all the "shots" are accessible to a viewer at once, and points out how this form of narration is also continued in the form of contemporary comics.

Figure 8, Quentin Tarantino. Kill Bill Volume 1. 2003

A similar type of spatial narrative can also exist in cinema. The use of split screens in films, is one form of montage that can also be called montage within a shot. Shots of multiple events form a single image. It is the opposite of temporal montage, which is the most common form of montage in films, where separate realities form consecutive moments in time. Another form of montage that has gained popularity through the development of new compositing technologies is anti-montage. Here the borders of the different elements are no longer emphasized but blended seamlessly (Manovich, 2001: 155-162). Two of these forms, montage within a shot and anti-montage, can be considered as forms of spatial narrative.

In Alan01 three units simultaneously display content in response to the user's action. In total there are five possible video outputs and one text display. Spatial narrative in the design of the installation can be seen in the way that the media clips have been scripted to interact. The head of Alan on one screen can be watching another Alan making violent facial expressions or contradiction emotional content can be simultaneously displayed on opposing sides of the space.

Collaborative experience

In a public installation a viewer is seldom alone in the space. She shares the space with other people and on some level shares the experience of the artwork. While comparing art installations to artwork distributed on CD-ROM's Christoph Blase (Artintact 2, 1995: 23) makes an interesting comparison, pointing out how a physical installation is to the CD-ROM what a cinema screening is to the video cassette. The CD-ROM has more potential for a private, individual experience, where as an installation is by it's nature more collaborative. In some cases the interaction with the piece can encourage users to co-operate or even participate in game-like situations. The communication between the users, their observations of each other and the consciousness of being observed by others become a part of the artwork. In Alan01 the interior space of the installation and the output of the system are visible for by passers and multiple people can view the content as one person is interacting with the system. In this sense it was the aim of the design to create a shared experience, which thereby could also attract people to approach and interact with the installation. Manovich describes a shared experience, in the case of viewers' interactions with computer installations, as a situation where one user's interaction with an installation becomes a new text for other people who are within the "arena" of the work. The actions of the primary user are altered by her awareness of the other people monitoring her. The user becomes a representative for the other people. Her attention is shared between the artwork and the observants (Manovich, 2001: 283). Similarly to what was discussed earlier about a users movement in space building the drama of the piece, the actions of the users can also be a part of the story of the piece.

When discussing the concept of collaborative experience in the context of non-material applications, the most natural case that comes to mind are online pieces that exploit some kind of multiplayer features. An interesting example of such a collaborative experiences are the art galleries in Second Life. There the experience is often quite straightforward mimicking a traditional art gallery visit. Only the users, or visitors of the gallery, in this situation, are represented by 3D avatars (see figure 9).

Figure 9, FairChang Village sim art museum in Second Life.

Yet any conceivable experience shared with other users' avatars in a virtual environment, is never quite the same as sharing the real physical presence of other people in a space. Human beings communicate with a wide variety of signals: speech, gaze, movements and gestures. We also often favor the combination of speech and gesture, instead of only one of the two (Kuivakari et al, 1999: 3). In virtual environments the range of the human sensory system is also greatly diminished. Touch, smell and not to forget taste, don't translate well into existing output technologies. The use of odors has been experimented with theatre, but also as early as in the 1960's in a standalone arcade machine called ***Sensorama*** by Morton Heilig (Laurel, 1993: 51-52), which presented for example a motorcycle ride through New York City, where the audience could sense environmental smells like exhaust fumes and pizza. In addition it featured stereoscopic filmic images and kinesthetic feedback. While the non-material environments are limited by the lack of multi-sensory output, at the same time they can have different advantages of their own. An online environment can liberate the users to take on different roles from what they are used to. The anonymity of the environment lowers the level of self consciousness and the user's approach to the content can become more playful. Users may say and do things they wouldn't dream of doing in real life.

Access and exhibition value

Walter Benjamin (1989: 148) defined the exhibition value of a piece of art by the effortlessness of its exhibition. It is easier to exhibit a small portrait statue than a statue of a divinity that has its fixed place in a temple. In the same way a small painting would have a greater exhibition value than a big mosaic. The accessibility of an artwork is therefore an important factor in its exhibition value. Following this logic one might say that an online version of an installation has greater exhibition value than the installation itself. However, even if an online artwork is easily accessible, at the same time it needs a good deal of publicity for people to actually find it. It is easy for it to fade into oblivion in the abundance of supply that exists in the internet. In the case of AlanOnline, at the time of the writing we haven't so far made any real marketing effort in order to gain a high volume of users to the online version. The reason for this is the highly experimental nature of the online version. The image retrieval system that is provided to us by the University of Glasgow is running on the same servers which they are using for their ongoing research projects, and we have experienced slowdowns and server timeouts for this reason. Therefore consciously subjecting the online version to a large amount of simultaneous users isn't sensible as long as the system isn't more reliable.

Alan01's exhibition value is mostly limited by the large size of the installation box. It requires a relatively large space just to fit inside a gallery, and it would probably look quite awkward in a space where it doesn't have a sufficient amount of empty space around it. Transportation of the

installation is not a big issue since it was designed to be easily dismantled into small pieces. The only other serious requirement for the exhibition space is its sensitivity to changing lighting conditions. Both the touchscreen interface and the web cameras for the morse code transmission need to be calibrated according to the lighting of the exhibition space and strong variations can potentially cause errors in the system. The lighting also affects the aesthetic experience of the installation, as the artwork looks best in a space with a dim lighting that doesn't cause reflections inside the installation box.

The quality expectations of an artwork are heightened by its exhibition. Entry fees or the physical effort of traveling to the installation location raise these expectations. Non-Material media art such as online pieces are more forgiving both with technical restrictions and also the effortlessness of engaging with the applications. It is acceptable to have smaller sized video clips or higher compression, because of bandwidth restrictions. It is also very easy for the users to return to an online piece and explore it as many times as they desire.

One could argue that an art installation in a public space, where a user stops to observe it spontaneously, is not that different considering its expectation value compared to an online artwork. However the fact that an installation has been chosen to be exhibited in a public space in itself leads us to believe that it has to have a certain level of approved artistic quality.

An installation can often be a one-off experience. It might be exhibited only once for a limited time, and the typical gallery visitor most likely will see it only once. The access to the installation is therefore temporally restricted. The limited access and lowered exhibition value at the same time work in favor of and against the installation art form. The expectation value of an installation is heightened and the audience is that much more demanding. Yet at the same time, the art form is well established and has a high appreciation compared to its non-material counterparts.

Immersion and embodiment

For many people the first thought that comes to mind from the word immersion is a 3D virtual environment that a user enters and manipulates suited up with a dataglove, head mounted display and various other input and output devices. Contrary to common understanding, immersion is not limited to interactive systems. The term immersion seems to imply the user's active participation or "penetration" to the system. However, this pairing of immersion and interaction is misleading and artificial. Being immersed can equally well be a passive experience, where the user's own will is suspended (Huhtamo, 1995).

Following Laurel's juxtaposition of theatre and interfaces, which I have discussed before in the section titled ***Human computer interaction and the interface,*** she also makes an interesting notion that traditional Greek theatre as well as historic campfires, where stories were told, can be considered as early forms of virtual reality (Laurel, 1993: 187). Similarly Kabakov (1995: 245) writes about the experience of viewing an installation and makes an analogy to a person reading a book:

> The reader is halfway into the book, submerged in its depth, has gone to where the author of the book sends him, and at the same time – if after all he is not a big naive boy – he realizes that in front of him is only paper and black letters, the author's style which he compares to that of other authors, and the book itself, which the reader compares to other books (and not later, but right during the process of reading), he understands what the writer wanted to say, he observes him, his maneuvers, goals, seeing that he is easily visible when he writes, etc.

Later on Kabakov(1995: 245) also recognizes that certain forms of art have a guaranteed submersion into the illusion ahead of time. He states that such forms are for instance theatre and cinema. In these art forms a cultural tradition has developed, where the viewers are seated statically, and most of all silently, in the dark. All discussion about the experience is limited either to the intermission or after the show. The darkness of the theater also serves to fade the viewers' points of reference to reality and make the viewers less conscious of themselves and each other.

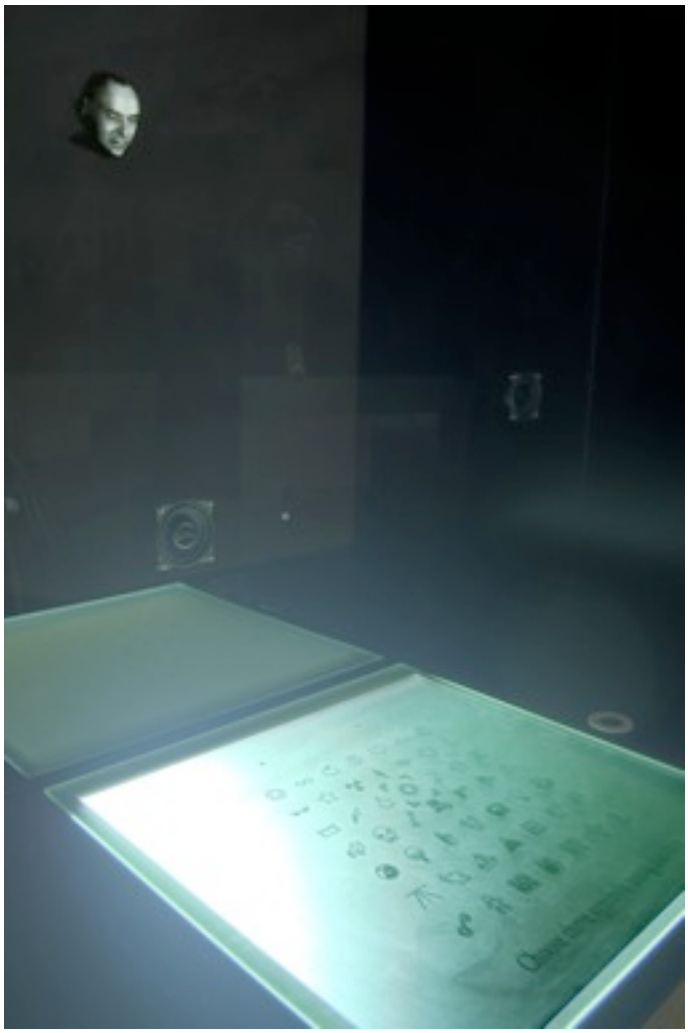


Figure 10, The interface of Alan01

Robert Smithson (in De Oliveira, Oxley And Petry, 2003: 51) raises the question of comparing installations and discotheques, suggesting that gallery spaces could become platforms for different forms of entertainment. Many contemporary installations make use of visual and audio elements that are very similar to those experienced in a discotheque. Such methods can be effective in encouraging the audience to forget the outside world and become part of the artworks reality.

Immersive systems such as virtual realities always have some constraints compared to real life. A certain set of rules is suggested or rather enforced on the user. The manner in which such constraints are mediated and the logic of the rules, affect the user's experience of the system. In Laurel's (1993: 102) opinion instructions, error messages and dialogue boxes, which are the common techniques in which constraints are indicated, are usually destructive to the user's engagement with the system, braking the user's immersion and forcing her to enter a meta-context of interface operations. Laurel (Ibid.) goes on to describe explicit and implicit constraints. The case of menus and instructions falls into the category of explicit constraints, which are undisguised and directly available. Implicit constraints can be deduced from the behavior of the system. An implicit constraint can for instance restrain a player from entering certain parts of a 3D world by placing high walls around the intended game area. This all boils down to the apparentness of software in a system, and how aware of the technology does the designer want the user to be.

In media art, an artwork's interface can be motivated by the work's content to such degree that the two can no longer be considered as separate levels – the content and interface merge into one. In such cases thinking of the interface as a separate level, would eliminate the artworks status as art (Manovich, 2001: 67). This philosophy was also an important point in the design of Alan01 installation's interface. The look and feel of the interface and the experience of using it, are integral parts of the piece.

When it comes to creating immersive non-material artwork, in my opinion the apparentness of software is one of the key factors. Some of the best immersive software interfaces can be found in computer and video games. Even though stereoscopic goggles and other new technologies like surround sound virtualization can enhance the experience of immersion, well designed environments without any technical gimmicks can be strongly im-

Figure 11, An immersive software interface in Ubisoft's Myst IV Revelation.

mersive and captivating. A certain level of immersion was also my aim in the design of AlanOnline. Interface components were designed as believable parts of the reality of the artwork, still compromising a little bit for the reason that the interface needed to be easy to use. Apparentness of software doesn't have to be a tradeoff between immersion and usability, but creating a design that accommodates both equally is always a challenging task.

Laurel (1993: 205) speaks in favor of VR instead of graphical interface presentations, pointing out how word and symbol based interfaces only speak to a relatively small and lately evolved part of the left cortex of our brain. Instead we should be doing the harder thing of designing interfaces speaking to the larger and more refined parts of our brains that process and construct worlds out of all of the human senses working together.

An embodied interface means a more freeform and natural way of working with a system, which lightens the cognitive load of the interaction. This is achieved by making the interface more transparent and direct (Kuivakari et al, 1999: 5). In a more practical sense embodied interfaces aim to use the human body as a mediator for the system's input and output to the user. This in turn can enhance the experience of immersion and make interaction more easy. Virtual realities which don't recognize the holistic human body, can even result in the user's experience of being amputated from the reality (Ibid., 1999: 71). A classic example of an embodied art installation is Char Davies' ***Osmose*** (1995), where the rhythm of the user's breathing and the orientation of her body are measured and used as controls for manipulating the environment. According to my definition of non-material media art, where there is no real control over input and output devices, embodiment is an aspect that is difficult to address. In theory datagloves and other novel devices are available for consumers, but in practice they are rare and expensive and for this reason there is little demand for content designed specifically for them.

Real-world objects and metaphors

What was previously discussed about virtual realities in the section about immersion and embodiment is closely related to the use of metaphors in interfaces. A major motivation for the use of real-world objects in artistic representations, can be their ability to lower the cognitive load on the audience. Real-world objects seem to make representations more accessible and enjoyable to larger audiences Laurel (1993: 125) The theory is, as Laurel (1993: 128) describes it later on, that people will naturally know what to do with real-world objects. The affordances of the metaphors inform to the user of the tools potential uses.

Figure 12

One crucial problem about interface metaphors that Laurel (1993: 129) recognizes, is that they in fact are not metaphors but rather similes. According to Laurel, a metaphor proposes that one thing is another, whereas a simile asserts that one thing is like another. The problem is that, we as the users can't know in what aspects an interface simile is different from its real-world counterpart. Laurel (1993: 31) also makes another critical notion about the use of metaphors in interface design: "Interface metaphors rumble along like Rube Goldberg machines, patched and wired until they are encrusted with the artifacts of repair that we can no longer interpret them to recognize their referents". Thinking of the relatively short history of graphical metaphors in screen-based interfaces, certain symbols have evolved as industry standards, trash cans are for deleting, folders are for organizing files and cogwheels imply system preferences. When design goes wrong

the graphical representation is either not visually recognizable or the affordance of the metaphor is only clear in the designers mind, but not understandable to the general public.

Of course metaphors are not limited to digital media, they can be found printed in books or painted on information signs. In Alan01 there are not really metaphors that have so much to do with the usability of the interface. However, since the touchscreen features 49 symbolic images that are connected to circa 150 words, the use of metaphors is a major part of the artwork. To make the work of designing the symbols easier, the words were chosen based on the condition that they had to fit into groups consisting of one to five words. For each group there was a common higher level word which was by its nature concrete and conceivable as a graphical presentation. These top level words were then drawn as symbols. The same set of symbols was also used for the image retrieval in AlanOnline.

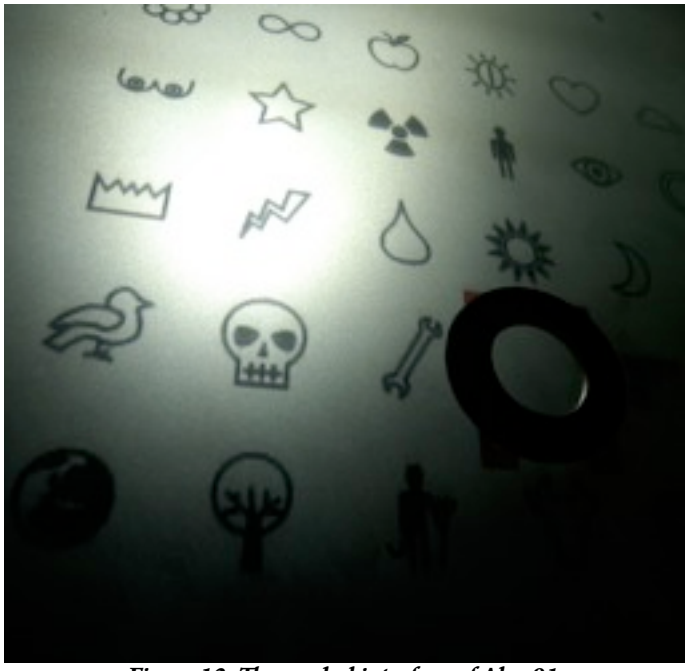


Figure 13, The symbol interface of Alan01

Comments and recommendations

Already when the design process starts, it is of utmost importance to define, what is the desired relationship between each of its parts. If a non-material version of a material artwork is created, what purpose does it serve, what is its motivation. How does the desired relationship affect the production of the artworks media content and how can the user experience be translated across each platform. The direction of the design workflow is of course not exclusively from physical to non-material, but can either be the opposite as in Alan Natachu's (2009) ***playing NDN,*** or the parts can be equally important where the production is not favoring the success of either one above the other. Also important in these initial design choices, is the family resemblance of the different parts. If there are sufficient resources to fully accommodate the individual content and technical production needs of each of the production's parts, they should still have enough similarities that they can be recognized as parts of the same production. Defining the relationship of the physical and non-material parts should also recognize how the chosen media affects the message that is being delivered. The physical installation platform has more means of delivering powerful emotions compared to a computer screen based artwork. It might make sense to consider if the message that the artwork is delivering to the users should be adapted so that it is fitting for the presentation media.

Equally important as the definition of the motivation of the artwork and its presentation form, is the consideration of the output and input technologies. Or in the case of a non-material piece, the selection of the platform and other technical aspects such as supported host operating systems, which define the range of possible devices that users may access the artwork with. This scope of devices respectively, will limit the target audience of the artwork. In my opinion these choices should be made firstly based on what technology is needed to ideally serve the content and the concept of the artwork. Secondly they should be based on the selection of the desired target audience – what kinds of devices are usable for the selected audience. And in the case of non-material art – who might be excluded as a result of the specified hardware and software requirements. Only after these considerations the designer should consider if the deployment of novel interface technologies might bring added value to the user experience. I recognize that there is an established tradition in media art, for works where the use of a new ground breaking technology is enough to justify the value of an artwork. In my opinion a purely technology oriented approach to art still remains shallow conceptually, and is less likely to maintain its artistic value on a longer time span. Technological innovations can serve as great inspiration for artistic production, but shouldn't be the sole motivation of any work. This relationship could be formatted according to the old aphorism, technology is a good servant but a lousy master.

In interactive artwork, interface design is a key factor in addressing the audience. In my opinion the design of the interface should be driven by the action that the user needs to perform. This is also important in the design of the physical aspects of the installation. Whether we were able to follow this ideology in the production of Alan01 and AlanOnline, can be questioned. Certainly the work was very educational in this aspect, and many possible improvements in the usability of both parts of the production were only noticed while monitoring the first actual users of the artwork. Even if we don't get around to making a new and improved version of the current production, the lessons learned will definitely be taken into account in future projects.

Following the discussion on interface design, what needs to be mentioned is the question whether the user should be challenged on the level of the interface, which was addressed in the section titled ***Human computer interaction and the interface.*** Is usability always to be expected in interactive artwork, or can the designer consciously create a piece that is challenging or even hostile to the user. As my background is in creating services and websites that always aim for a high level of usability, for me it is difficult to think of creating deliberately unusable interfaces. But I still think such design can be justified, as long as the "challenging" interface is the result of a conscious design choice, which can be argued to serve the content and the concept of the artwork. The danger that lies in challenging the user too aggressively on the level of the interface is of course that without sufficient motivation and reward, the user will find the whole artwork as uninteresting and unattractive. People also tend to blame themselves when they fail to use physical devices and computer software (Norman, 1988: 34). I have personally witnessed the same phenomenon while trying to help friends and relatives use various appliances varying from television sets to word processing software. In the case of an artwork, creating a challenging interface comes with the risk of causing unjust self blame or feeling of inferiority to the users. Designers should think twice before causing such harm to their audience. Contrarily interface designers such as myself are always more keen to blame the design of the interface than their own insufficiency.

The consideration of space is one of the key questions, which makes the physical and non-material artwork different. Where in physical installations the focus is on how spatial design can be used to the benefit of the user experience, in non-material work the questions is how space can be translated into a non-material presentation, or if it is at all necessary. Even the decision to omit the use of space, is a design choice that is related to space. Even though the direct translation of physical space to non-material can be very difficult, the use of virtual space or some other non-material presentation of space, can also have its own advantages. Physical constraints of the real world do not exist in the non-material. Typically the constraints of the non-material presentations have more to do with limitations of software and hardware, which are more visible in the level of detail of the presentation, rather than the physical dimensions or material costs. There-

fore the designer should consider the strengths and weaknesses of both sides, taking advantage of the characteristics, rather than trying to directly copy one concept to another presentation format.

As space comprises also the people presently within the space, collaborative experience is tightly knit to the discussion of the use of space. The designer needs to consider if a collaborative experience is important to the work at hand. Does it bring added value to the user when the experience is shared with others, or would it be more fitting for the user to feel isolated and free from the pressure of operating under observation of others. In non-material artwork the question that follows is, how can a collaborative experience be suitably translated to the presentation format. Here also, it is good to consider what the strengths of physical versus non-material collaborative experiences are. Non-material presentations can encourage users to take on different roles, as they are less conscious of their own physical appearance. Physical installation are more powerful in mediating a collaborative experience that makes use of all our senses and even subtle unconscious body language that might be impossible to display in non-material artwork.

The sum of the design choices that have been described previously in this section, amount to the exhibition value and accessibility of the artwork. These two factors should be considered during every step of the process. It is good to have a relatively rational strategy regarding this question. Alternatively, an approach purely dictated by artistic values could of course be only to consider the artistic experience and disregard everything else. But in my opinion, it makes little sense to create an artwork that isn't accessible to anyone. If a physical artwork is more of a one-off exhibition by its nature, there is more freedom in its design and it can be custom designed for the exhibition space. Otherwise the transportation and re-assembly of the artwork needs to be taken in to consideration. The potential places where the installation can be exhibited are affected by its design.

5. Case study

In this chapter I explain the concept of the case study production and elaborate on its technical solutions. I focus on some stages of its development and briefly go through the history of how the artwork found its final shape. I also go through certain design choices and explain the reasoning behind them.

Alan01

I joined the design team of Alan01 in October 2008. At the time it was clear that the content of the installation would be centered around the life of Alan Turing, but the actual concept was still very much open. Additionally at this phase it was suggested by Merja Nieminen that we might look into the possibility of using a touchscreen interface similar to reacTIVision, which is an open source computer vision framework for the tracking of fiducial markers and multi-touch finger tracking (reacTIVision, 2009).

In November 2008 the entire design team travelled to Barcelona to participate in a SALERO project meeting and to get acquainted with the project's software tools and the people who were responsible for developing them. During the week each tool provider gave a demonstration about their software, after which we discussed with them about how the tools could be integrated into our production. From the point of view of a designer, this process was slightly backwards,

Figure 14, An early concept drawing for the touchscreen table

because the tools started to strongly affect the concept of the artwork, where as in a more usual design process, designers would first think of what they want to create, and only then start to look for the tools best suitable for the purpose.

Image retrieval

In Barcelona one tool seemed to show more interesting potential to us than most others. University of Glasgow's Aspect Browser is a content based image retrieval tool that can be configured to use multiple different methods to try and match visually resembling images. We came up with the concept of combining the image retrieval tool with our idea of using the touchscreen surface, in such a way that the user of the installation could draw on the surface and an image retrieval would be made based on the user's drawing. The result of the image retrieval would then be used to produce further content for the user. Our first tests of the system were made using image set of about 1700 photographs that were gathered from Yahoo! and Flickr. The images were chosen based on a list of keywords we had gathered, which were related to Alan Turing. However the resulting image set was not found to be interesting enough to become the backbone of the installations content. Another problem that ensued, was that comparing the relatively simple line drawings, produced by the user, with the photographic image set resulted in the system strongly favoring certain photographs that typically consisted of few details and large evenly colored areas.

Figure 15, First test setup of the actual hardware that was used in the installation

Figure 16, Finger drawing with the touchscreen interface

To solve these issues we decided to create our own limited set of fifty images, which were symbolic line drawings that were graphically more similar to what the users could be expected to draw. With the limited, predefined image set we were also able to connect the image retrieval results with our other media assets and thereby eventually create a textual script for the installation. This was a step in the right direction, but still the image retrieval results delivered by the Aspect Browser tool were not of satisfying quality for our team of designers. Many different search methods were provided to us by our partners at Glasgow, some of which were developed in an attempt to solve our specific issues. The conclusion we came to in the context of our production was that the level of accuracy of the results has to be relatively high, so that the use of the tool doesn't just become a technical gimmick. Instead it should be an integral part of the artwork.

In our production one of the central issues was the predictability of the retrieval results. In an interface that uses this type of technology, the user is tempted to start to test the system or even play against it. Seeing the results which the system has delivered previously, affects the imagery that a user starts to draw henceforth. If a user tries to replicate the images she has seen in the previous results, the following results need to be consistent in order to avoid the feeling of randomness in the system. When the resulting image set is limited and preselected, the level of graphic detail also needs to be relative to the systems ability to recognize details. In the case of the experimental art production, an added factor was limiting the number of search results.

Figure 17, Symbol set for Alan01 and AlanOnline

Primarily we wanted to only show the user the top matching result, but if the user was presented with top ten retrieval results, it might be sufficient for the user, if a significant ratio of those results are relevant, the first ranking result doesn't have as much significance.

Symbol interface

Additionally we experienced some problems with our own drawing interface. The finger tracking was prone to interference and would have required precise calibration. Some of these problems could have been solved by using infrared lighting with a better quality camera. However it seemed doubtful, if we had enough resources to make the finger drawing interface robust enough for an installation that needed to operate in varying light conditions for a long time period. We decided on a backup plan that we could fall back on incase the image retrieval system and the drawing interface couldn't be fixed to work at an adequate accuracy. The alternative interface was a simple grid of seven-by-seven symbols that the user would choose using a ring.

The hardware of the touchscreen table consists of a Mac mini that is connected to a regular video projector which projects the computer image upwards via a mirror. Under the table positioned at its center point is a digital video camera. The camera records the changes in color on the glass table. The data from the camera is read by a program running in Processing. The program uses a simple blob detection library to recognize when an object is placed on the surface. We used a white plywood ring as a tool of interaction for the user. The software pointer on the glass surface follows the physical object on the screen. Using an object of a known size and color enabled us to filter the video image for noise and reflections, and made the software robust and adequately reliable for use in a public installation. For this reason I suggested the use of a physical object instead of trying to track the users' fingers.

Figure 18, International Morse code alphabet

When the ring is left on top of a symbol for a period of a few seconds the system locks that symbol and moves it on the top part of the screen. Alongside the symbol appears a word that is contextually connected to it. Each of the 49 (see figure 17) symbols have one to five connected words, any one of which can be randomly chosen by the system. The number of the symbols was chosen on the basis that the interface had to be simple enough, so that all the symbols could be visible and available all the time. A seven-by-seven symbol grid was ideal for this purpose. However, mapping the 49 symbols directly to a matching amount of words, would not have enabled the presentation of a

sufficient amount of content to make the installation interesting, whereas having multiple possible words come up from the same symbol encourages the user to further explore the artwork.

Once the user has chosen three symbols the main unit goes into a transmission mode, wherein it translates the selected words into light signaling sequences. The code sequences are transmitted by flashing the main installations touch screen in white and black colors, which is received by the other three computer units of the installation.

Light signaling

A simple XML file serves as the database and structure for the content of the installation. The XML file is essentially a code key that translates the words to sequences of light flashes that vary in length from one to seven flashes. Each of the flashes is translated to be either long or short, and every burst of light within one message is followed by a short moment of darkness. Each complete message is followed by a dark period, the duration of which is at least twice the length of the short darkness. In this way the system defines when a message is completed. Adjusting the duration of light and dark periods affects the susceptibility to interference. The longer the durations are, the less likely the system is to misunderstand the message. The concept of this code is similar to Morse code, with the difference that the codes are not mapped to letters and numbers as in the regular Morse key (see figure 18).

Within the context of the installation, a user can manipulate the system by blocking a code sequence. The system can, for instance, misinterpret a long sequence such as "--...--" for a shorter one like "--...", if the user decides to block the receiving camera half way through the message. Since the code key is built in the fashion of a pyramid, shorter messages always have some meaning coded into them. Thus it is more likely that short messages are received without error and that longer messages are likely to be mistaken for shorter ones.

Figure 19, The code key is shared by the sending and receiving units

The use of this traditional communication method serves as a historical reference to the work of Alan Turing as a code breaker during World War II. It can also be seen as a reference to how this tradition is still amidst us, as morse code and sending messages with directional spotlights are used by modern armies, as a close range communication method that is difficult for the enemy to intercept. On the level of the user's experience it makes the flow of the data visible and enables the user to alter the code by blocking the light that is sent from the main unit.

The concept for the light signaling communication between computers was initially developed during a Pure Data workshop held by M. Koray Tahiroglu in Media Lab Helsinki during September 2008. The original idea was to create a system where two computers could have a conversation with each other, in a way where the flow of data is visible to the viewers. The possibility of allowing errors, where one machine misunderstands the other or where a viewer intervenes, would then make the conversation between the two machines interesting and unpredictable.

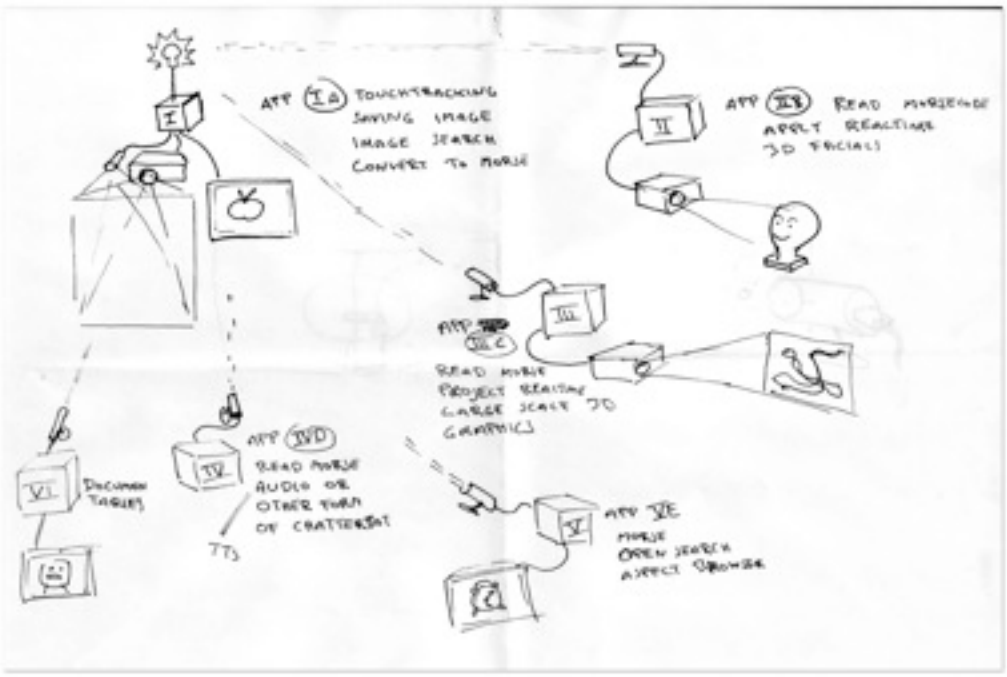


Figure 20, Early concept drawing of the Alan01 installation

Receiving the message

Inside the installation box are three receiving computers, each of which is connected to a web camera aimed at the main unit's flashing surface. These three machines are the media playback units of the installation. Using the code key, the units individually recognize the message from the main unit. The message always consists of a series of three words, which the receiving units read one-by-one and add to their playlists, which are made visual to the user as a list of words appearing on the bottom of each receiving unit's display. This way it also becomes apparent if one off the units misinterprets a message. Once the main unit has transmitted three symbols, the playback units start to play the content for each item in their playlists. Each machine has a customized script where every word has twenty seconds of content connected to it. The playback machines each make use of a 24" display, a small sized video projector and one mono speaker.

Alan's voice

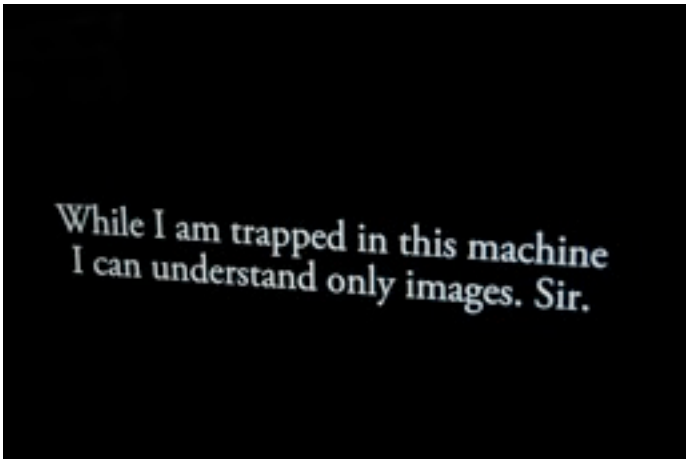


Figure 21, One of Alan01's responses

One of the playback units serves as the voice of Alan Turing. The unit displays Alan's response to the selected word as a sentence on it's display and plays the same sentence through its speaker. The sentences are based on Leena Saarinen's script for Turing Enigma, which was Crucible Studio's previous production, where user's could engage in conversation with a chatterbot playing the role of Alan Turing's spirit trapped inside the World War II encrypting device Enigma. The voice of Alan Turing was created with URL's Text-to-Speech synthesis tool, which is one of the SALERO project's tools. In order to make sure that the sentences would be understandable, we felt the need to have them displayed on the computer screen at the same time as they are played from the speaker. The synthesized voice is at times quirky and faulty, but this far from perfect computer voice seemed to fit the theme of our installation nicely and using the recorded voice of a human actor would have been a worse alternative. As mentioned before the synthesized female voice was finally transformed to a male voice fitting for the character of Alan Turing using UPF's Sound Transform tool.

Hannu Kivioja

The displays of the two other playback units are used to play movie clips of Alan Turing's emotional responses played by actor Hannu Kivioja. These short movie clips are Alan's reactions to the user's input and to everything that is happening around him. Where as the synthesized voice lacks all emotion, the video footage is quite the opposite. In the footage Alan also becomes conscious of his mediation within the installation, as the users can see him looking around at the 3D busts and the surrounding video screens. The footage was filmed at the studios of Media Centre Lume.

Figure 22, Hannu Kivioja is Alan Turing

3D projections

Hannu Kivioja was also used as a model for the 3D model of Alan Turing's head. In the installation the 3D model has been printed as three life size plastic busts. Each of the installation units project 3D animations on one of the busts. The 3D model of Hannu Kivioja's head was also used in some of the animations. Projecting a 3D animation on a similar 3D object, creates a strangely powerful lifelike image, almost like a hologram. The animations were created by Merja Nieminen, and they range from highly abstract animated shapes to live clips of Hannu Kivioja some of which were enhanced with effects like an overlay of red color filling the face from top to bottom.

Figure 23, 3D animations projected on the three heads of Alan01

The soundscape

In addition to the synthesized voice of Alan the installation features two other types of sound elements. During the filming of the video footage some non-verbal, emotional sounds were performed by Hannu Kivioja and recorded for the installation. Additionally sound designer Tuomas Skopa created ambient soundscapes that were fitting for the different themes of the content and for the same variety of emotions that was covered in the animations and the live footage.

Figure 24, A page from the Alan01 media playback script

The script

In order to create the XML code key files for each of the playback units, we first had to write a script for the media content. For this we needed to have all of the media assets available before we could start the process of outlining what piece goes where. As could be expected, we got the final media assets together very late, only about two weeks before the premier of the installation. Schedule wise this was a nightmare, but also something we had anticipated. We had to work fast, because the physical and technical assembly of the installation were going to occupy a lot of our time during the last week before the premier, and the script had to be ready for testing before that. We created a binder folder with roughly 150 pages for this purpose. Each of the pages represented one of the words that could be sent by the main unit. Every page was then split into three columns, each representing one of the playback units, and in each column there were three slots for the different output channels – one for the 3D projections, one for the video clips and one for the audio channel (see figure 24). Above the content columns there was information about what the sent word was, what symbol had triggered it from the table, what was the sentence that would be presented as Alan01's response and a unique identifier number that could be used to track which light signaling string was connected to the word.

Jaakko Pesonen and I then sat down over the course of a few days and started going through the pages one by one. During the process we kept all the media assets close at hand, so that we were able to keep a clear understanding of what the whole of the installation would be like. If it wasn't for the fact that were running so close to the deadline when we had finished the first version, it would have been preferable to make a second round of content production based on the understanding that we gained through the process of scriptwriting. Already as we were mapping the assets to the content it was clear that were missing certain ranges of emotion in some parts of the media. As we had fed the data to the installation units, some parts of the script were found to be too empty and other parts were found to be perhaps too repetitive. Some minor adjustments were made on the level of the script before the final premier.

It was also apparent that at this stage we were by no means representative of the average user of the installation, we already knew the media assets too accurately and could no more have a naive explorative approach to the content. The intended time span a single user would spend interacting with the installation was no more than a couple of minutes, during which time it was highly unlikely the user would find the content to be repetitive. It was more important that none of the selected words would deliver too little content, since it was much more likely that some users might only experience one set of three words. On the whole we were positively surprised that the content of the installation did have a consistency and the different media output channels seemed to speak the same language and create interesting contrasts with each other.

AlanOnline

When the project started, my vision was that the online version should be an independent piece of art that shares certain media assets with the installation and is connected to it thematically. The reality of the production was that the design, programming and hardware setup of the installation took so much of my time and energy, that the online version received much less of my attention. At the same time, the design of the online version was to some degree sacrificed, as it became more of a platform for SALERO tool integration rather than a unique art piece.

The online version uses UG's image retrieval system in the fashion that it was originally intended to be used in the physical installation. I chose to keep the image retrieval technology as a part of the online version, partially due to the fact that there was pressure to integrate as many as possible of our SALERO partners' tools into the experimental production. This was very much my personal choice. At the same time I also felt that the concept of the image retrieval as an interface tool was very interesting, even if the results weren't perfect. We had already done so much work and co-operation with UG's Robert Villa, Feng Yue and others, that in my opinion the work deserved to be exhibited despite of its experimental nature and apparent weaknesses. Somewhat contrary to what I write in the previous chapter in the section titled ***Human computer interaction and the interface,*** for this technology I felt that the experimental approach was better fitted for the online version, instead of the physical installation. Perhaps that is because the experimental nature is not really on the level of the interface, but rather in the retrieval of the content.

Figure 25, The AlanOnline interface

Where as in the installation there is the main unit and its three subunits, in the online there is one machine performing all the tasks, and the user is figuratively placed inside the machine. The user's tool of interaction is a black and white representation of a human hand, with its index finger extended. The user can draw on the top surface of a white translucent cube positioned in the middle of the browser window. Once the drawing is finished the Flash application sends it back to the server, where it is used for the image retrieval that is made based on the same symbol set that was used in the installation. The image retrieval system is a server side Java application that is accessed with a SOAP (Simple Object Access Protocol) call from the Media Lab server where the AlanOnline Flash application is hosted. Three picture planes, stacked in perspective on the left side of the cube, display the top image retrieval results. Above each symbol is a word related to the symbol, which is chosen from the same script as in the installation. As the user clicks on the image retrieval results AlanOnline responds with the same written sentences and synthesized voice as in the installation. As an additional visual connection between the voice and the imaginary computer a sound wave spectrum is displayed above the sentence and it reacts to the voice.

Illustration of two computer displays float in mid-air beside and above the cube. The video footage and animations that were displayed on the computer screens and projected on the 3D heads is presented through these two displays. The original installations media script was adapted for this two display format. The decision of reducing the number of video outputs from five to two was mostly dictated by the online format's restrictions. Firstly the available resolution of the browser window is quite small, therefore fitting multiple video images in the same window would have forced them to be very small and would also have required a different less appealing graphic layout. Secondly bandwidth and streaming media was a serious concern. I wanted to keep the online version relatively accessible with ordinary internet connection speeds. The video clips are in FLV format, and they are streamed each time they are needed. In total the whole library of FLV files amounted to more then 100 megabytes, so loading the files straight away when the page is loading was out of the question. Simultaneously loading five different video files would have also inevitably slowed down the experience. Adapting the media script for the online version proved to be challenging also for the reason, that some clips that worked very well when projected on the 3D heads looked awkward as flat video images. Also the series of three media clips, used in the installation, was replaced in AlanOnline with a system where a single symbols media content is played back at a time. This compromise somewhat broke the concept of narrative, which is built by the succession of media clips in the physical installation, but expecting the user to passively view a stream of media for three times twenty seconds seemed like a bad idea. Even during the playback of a single symbols media content, the user can intervene by choosing another symbol or by making a new image query.

User tests

As a part of our experimental productions SALERO framework, we were required to conduct user tests in order to evaluate the software tools' usability, usefulness and the quality of the resulting media. Additionally we took advantage of the opportunity, and presented additional questions about the concept of the artwork, which were of interest to us. The user tests were conducted by a third party evaluator Abhigyan Singh, a fellow Media Lab student. He observed and interviewed audience members during their interaction with Alan01 installation and AlanOnline. Additionally there was an online survey form that was e-mailed to the users to be filled on their own time. The survey form had three major sections: a) User Profile b) Alan01 installation c) AlanOnline project website and Turing Impact films. The survey used five level rating scales (e.g. "Very Easy", "Easy", "Normal", "Difficult", "Very Difficult") along with an additional rating of "Not Applicable".

The overall experience of the Alan01 installation received positive rating from 95% of the users. Positive in the evaluation meaning the top two rating scales, for instance "Very good" and "Good", and negative accordingly meaning the bottom two rating scales of "Bad" and "Very bad". The quality of the production was rated high. The quality of the animations, graphic design and video clips all received positive scores from more than 80% of the users. The artistic quality of the textual narrative received 70% positive response and the sound 45% positive and 45% average. The results for the sound quality were probably affected by the quality of the speech synthesis and the low quality speakers that were used. The usability of the installation was rated to be relatively easy, receiving 52% positive and 35% average feedback. However, the feedback of the interface was rated as difficult to understand with 30% negative and 44% average score. The recognition of the symbols received 39% negative responses and it seemed that the relation between the symbols and the words was not always very clear. It was also clear that many of the users didn't realize the way the light signaling was used to transmit the message to the playback units.

AlanOnline's overall experience also received high ratings of 76% positive and was relatively easy to use receiving scores of 43% positive and 29% average. The graphic design of the online version received 53% positive feed back, where as the quality of the image retrieval results was perceived weak, 47% of the users rated it average and 28% negative. The instructions were easy to use and follow, 58% positive and 24% negative, but they were also found to be necessary as many users had to rely on them in order to successfully operate the interface. The use of the hand metaphor as a mouse cursor seemed to be confusing to some users. Thinking backwards about the design process, the hand metaphor really is a relic that would have connected the online version to the physical installation, had the drawing interface been used in Alan01 also. Therefore the cursor should change to a pen, or other metaphor that suggests drawing, when it hovers over the canvas area.

The first versions of both the installation and the online version were built up for exhibition in a very limited time, and there was little chance for fine tuning. If the installation will be later exhibited on another venue, many parts of the artwork will be revised and developed further. The results of the user tests will be a great resource in its remaking. The same can be said about the online version. Since the meaningful development of either part would require production of additional media content, developing the online version separately from the physical installation is at the moment unlikely to happen.

6. Conclusions

In the beginning of this thesis I set out to study the characteristics of the presentation media that affect projects, where some parts exist physically while others non-materially. Following that question I have endeavored to shed light on how such characteristics behave in reality. In chapter four I listed the characteristics that I consider essential to this topic. This listing can by no means be all-inclusive, but rather my personal vision that is based on the literature research I have made for this thesis, on my practical experience from the case study production and on conversations I have had with professionals and colleagues. The key concepts I came to write about are: technical aspects of the presentation media, human computer interaction, interface design, space, spatial narrative, collaborative experience, access, exhibition value, immersion, embodiment, real-world objects and metaphors. In the end of chapter four I made more thorough comments and recommendations concerning the nature of these characteristics. This final chapter is an abbreviated sum up of the quality of such features.

It is important to understand, that both physical and non-material artwork have certain aspects in their design process that can be specific and exclusive to the presentation form. Both have their unique restrictions and strengths. For instance the nature of hardware design in a physical installation actually means assembling all the devices needed, where as in a non-material work the designer needs to consider what devices the end user needs to have in order to access the work. Physical space asserts restrictions to an installation in what is actually possible to build in the exhibition space and often the installation has to accommodate various different venues. At the same time physical space opens up different opportunities that are difficult to translate into non-material artwork. An aspect closely connected to space is collaborative experience. Collaborative experiences can be created in both non-material and physical art, but the experience can never be quite the same. Spatial narrative is also closely related to space and spatial design. Real physical space naturally supports the construction of spatial narrative. Non-material presentation media can also offer different but equally effective forms of spatial narrative. In contemporary screen based two dimensional representations there is also an interesting connection to the historical tradition of spatial narrative in visual arts such as renaissance fresco paintings.

Access and exhibition value are strongly affected by the presentation format of the artwork. In installations the physical dimensions and other requirements for the exhibition space can limit the accessibility of the artwork. The exhibition value can also be limited by temporal constraints when an installation is only exhibited for a limited time. Non-material presentation format is more free of temporal and geographical constraints. The challenge is rather in gaining sufficient exposure and publicity for the artwork.

In productions where physical and non-material versions are created around the same theme it is important to define the relationship of the different parts. What purpose do they serve? Is an online version only made to promote physical installation or is it created in order to make the artwork accessible to a wider audience. Or perhaps the two are more organically connected, sharing information and adapting their content according to the counterpart.

Whatever the presentation format, interface design is a very important part of the artwork. In works that enable the users' active participation, interface design needs to be expanded to interaction design. In both passive and interactive art pieces, it is important to first define what the desired action of the audience is and then design an interface that supports it. The use of real-world objects and metaphors is an essential part of interface design. Such interface objects exist in both physical an non-material artwork. What is important, is that the metaphor that is used clearly affords the action that is is used for. Misleading or weak metaphors can be frustrating to the user and make the interaction unattractive.

Since the range of input and output devices is limited to the standard appliances that are available to consumers, embodiment is usually exclusive to physical installations rather than non-material art forms. Embodiment can be a useful tool for lightening the cognitive load of the interaction and enhancing the user's immersion to the artwork. Immersion in turn can encourage the audience to forget the outside world and become part of the artworks reality. Even though physical props can be very helpful in the design of an immersive experience, immersion is not exclusive to physical artwork. In non-material artwork the designer's focus is in creating captivating virtual environments and interfaces that fit in as believable parts of the artworks reality.

When I started writing this thesis, I had very little theoretical knowledge of the topic. Part of my motivation for this work was precisely the fact that I wanted to study a field that was completely new to me. A topic where I had no experience, but which I still found very interesting. The actual building of the hardware setup for Alan01 installation, was a similar challenge. These two intertwined projects presented an opportunity to take on a new professional field. Much of the writing happened simultaneously with the Turing Machine production, which was beneficial for both the practical design process and my research work. I believe that this work has given me a good basis for future productions and research work, in both artistic and commercial projects.

References

Artintact 2 (1995) Cantz Verlag

Artintact 3 (1997), [CD-ROM], Cantz Verlag

Benjamin, W. (1989/1936) "Taideteos teknisen uusinnettavuutensa aikakaudella", in Koski, M., Rahkonen, K., Sironen, E. (ed.) *Messiaanisen sirpaleita*, Kansan Sivistystyön Liitto, Tutkijaliitto, pp 139 – 173.

Bolter, J. D. And Grusin, R. (2000) *Remediation,* The MIT Press

CyberArts 2006 (2006), [CD-ROM], Ars Electronica Center & Sony DADC

Davies, S. (2001) "DEFINITIONS OF ART", in Gaut, B., McIver Lopes, D. (ed.) *The Routledge Companion to Aesthetics,* London: Routledge

Davis, J. (2009) Manifestation, [online], Available: http://www.murdim.com/earth-manif/manif_290109.html, [20 Mar 2009]

DeLappe, J. (2008) The Salt Satyagraha Online, [online], Available: http://www.unr.edu/art/delappe.html, [22 Mar 2009]

De Oliveira, N., Oxley, N. And Petry, M. (2003) *Installation art in the new millenium,* London: Thames & Hudson, Ltd.

Hodges, A. (1995) Alan Turing: a short biography, [online], Available: http://www.turing.org.uk/bio/part1.html, [12 Jun 2009]

Huhtamo, E. (1995) Seeking Deeper Contact: Interactive Art as Metacommentary, [online], Available: http://www.kenfeingold.com/seekingdeeper.html, [8 Apr 2009]

Kabakov, I. (1995) *ON THE "TOTAL" INSTALLATION,* Bonn: Cantz Verlag

Kuivakari, S., Huhtamo, E., Kangas, S. and Olson, E. (1999) *Keholliset käyttöliittymät,* Sipoo: Teknologian kehittämiskeskus

Laurel, B. (1993) *Computers as Theatre,* Addison-Wesley Publishing Company Inc.

Lieberman, Z. (2006) Drawn, [online], Available: http://www.thesystemis.com/drawnInstallation/, [22 Mar 2009]

Manovich, L. (2001) *The Language of New Media,* Massachusetts Institute of Technology

Media Lab Helsinki (2009), [online], Available: http://mlab.taik.fi/research/research_groups/crucible_studio, [8 Jun 2009]

Natachu, A. (2009) Playing NDN, [online], Available: http://www.playingndn.net/2009/Home.html, [1 Apr 2009]

Norman, D. (1988) *The Design of Everyday Things*, London: The MIT Press

Harper, D. Online Etymology Dictionary, [online], Available: http://www.etymonline.com/index.php?search=protagonist, [19 Apr 2009]

reacTIVision (2009), [online], Available: http://reactivision.sourceforge.net, [3 Aug 2009]

Saarikangas, K. (1998) "TILA, KONTEKSTI JA KÄYTTÄJÄ. Arkkitehtonisen tilan, valla ja sukupuolen suhteista", in Saarikangas, K. (ed.) *Kuvasta tilaan: taidehistoria tänään*, Tampere: Vastapaino, pp. 247 – 298.

SALERO (2009), [online], Available: http://www.salero.eu/media/pdf/SALERO_Press_EN.pdf, [8 Jun 2009]

List of illustrations

Figures 1, 3, 4, 6, 8, 10, 13-25, photographs and illustrations by Teemu Korpilahti

Figure 2, source: http://planetasperger.files.wordpress.com/2009/05/1954_turing_large.jpg, [Jun 2009]

Figure 5, source: http://www.kenfeingold.com/catalog_html/wherei.html, [Jul 2009]

Figure 7, source: http://en.wikipedia.org/wiki/File:Courbet,_Un_enterrement_%C3%A0_Ornans.jpg, [Mar 2009]

Figure 9, source: http://slurl.com/secondlife/FairChang%20Village/197/163/21, [Jul 2009]

Figure 11, source: http://www.ubi.com/resources/binary/69/17495.gif, [Jun 2009]

Figure 12, source: http://www.legion.org/documents/legion/posters/1126.jpg, [Aug 2009]